

【図10】 この発明の実施の形態7を示す平面図である。

【図11】 この発明の実施の形態7を示す断面図である。

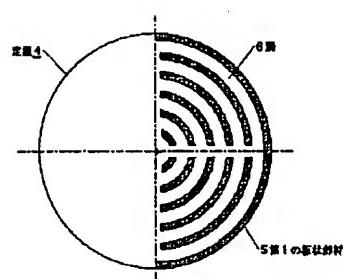
【図12】 従来の均熱装置を示す断面図である。

【図13】 従来の均熱装置の表面温度分布を示す特性図である。

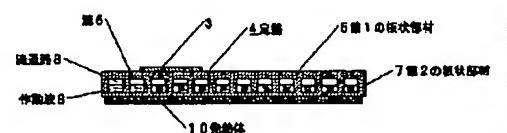
【符号の説明】

4 定盤、5 第1の板状部材、6 溝、7 第2の板状部材、8 流通路、9 流通路、10 発熱体、11 伝熱性部材、12 フランジ体、13 押え部材、15 フランジ体、16 押え部材、17 取付具、19 発熱体、20 発熱体、21 発熱体、22 流通路、23 流通路。

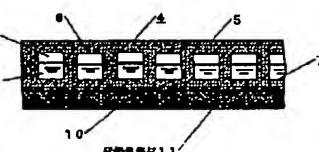
【図1】



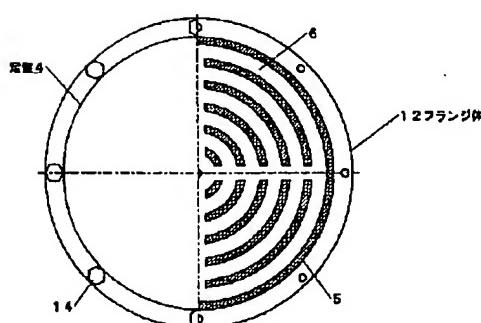
【図2】



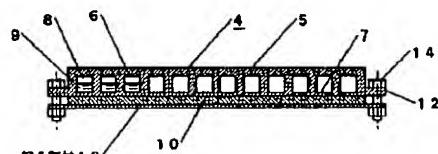
【図3】



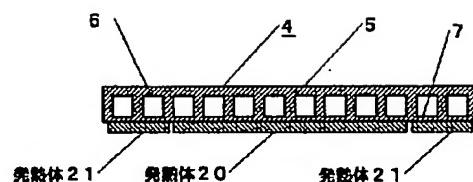
【図4】



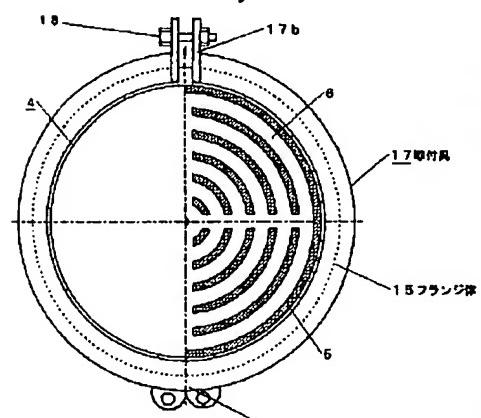
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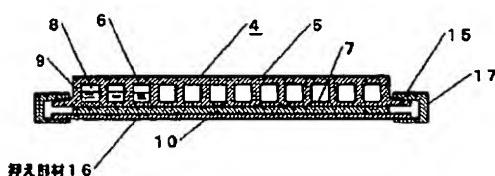
【図9】



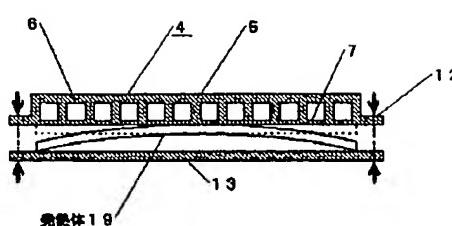
【図6】



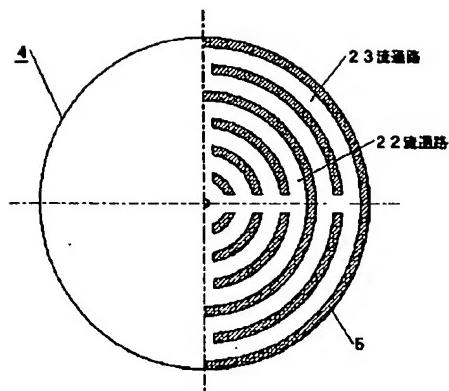
【図7】



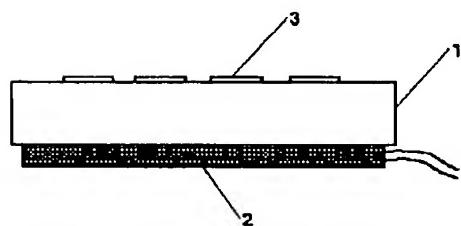
【図8】



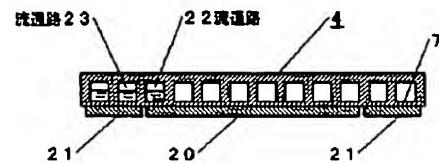
【図10】



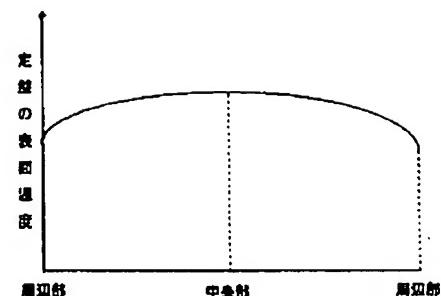
【図12】



【図11】



【図13】



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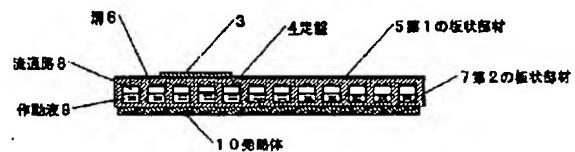
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(54)【発明の名称】 均熱装置

(57)【要約】

【課題】 平面状の熱源2を定盤1へ取り付ける際、全面にわたって定盤1と接触させることは困難であり、定盤1の表面の温度分布の均一性には限界があるため、厳しい温度分布精度を要求される被加工物3への適用は無理であり、又、定盤1の周辺部は中心部に比べて放熱が大きく、被加工物3が全面で均一に加熱されず、加工精度が低下する等の課題がある。

【解決手段】 溝6が複数形成された第1の板状部材5とこの第1の板状部材5に形成された溝6を覆うように第1の板状部材5に接合される第2の板状部材7により構成され、上面に被加工物3が載置される定盤4と、第1の板状部材5と第2の板状部材7との間に形成され、内部に所定量の作動液9が充填される複数の流通路8と、被加工物3を定盤4を介して加熱または冷却する平面状の熱源10とを設けたものである。



【特許請求の範囲】

【請求項1】 溝が複数形成された第1の板状部材とこの第1の板状部材に形成された溝を覆うように上記第1の板状部材に接合される第2の板状部材とにより構成され、上面に被加工物が載置される定盤と、上記第1の板状部材と上記第2の板状部材との間に形成され、内部に所定量の作動液が充填される複数の流通路と、上記被加工物を上記定盤を介して加熱または冷却する平面状の熱源とを備えたことを特徴とする均熱装置。

【請求項2】 請求項1において、定盤板と平面状の熱源との間に伝熱性部材を装着したことを特徴とする均熱装置。

【請求項3】 請求項1において、定盤の外周縁部に設けられたフランジ体と、上記フランジ体に係合され、平面状の熱源を上記定盤との間で挟持する押え部材とを備えたことを特徴とする均熱装置。

【請求項4】 請求項1において、定盤の外周縁部に設けられた傾斜部をフランジ体と、平面状の熱源を上記定盤に接触させる押え部材と、上記フランジ体と上記押え部材とに係合され、一方側が枢点となり、他方側が一方側を枢点として開閉し、上記平面状の熱源を上記定盤と上記押え部材との間で挟持させる取付具とを備えたことを特徴とする均熱装置。

【請求項5】 請求項3または請求項4において、平面状の熱源をあらかじめお椀状に形成し、定盤と押え部材との間で挟持させることを特徴とする均熱装置。

【請求項6】 請求項1において、平面状の熱源を複数に分割したことを特徴とする均熱装置。

【請求項7】 請求項6において、複数に分割された平面状の熱源に対応して第1の板状部材と第2の板状部材との間に形成された流通路も複数に分割したことを特徴とする均熱装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、例えば樹脂成型品、半導体ウエハ、液晶パネル等の被加工物を加工される定盤上で均一に加熱あるいは冷却する均熱装置に関するものである。

【0002】

【従来の技術】従来の均熱装置としては、図示はしないが例えば特開平6-278139号公報に示されるように、定盤の内部に加工された穴にヒータおよび冷却管をそれぞれ挿入し、ヒータに通電および冷却管に冷却水を流通させることにより、定盤を直接加熱、冷却するものの、又、図12に示すように、定盤1の下面に平板状の発熱体2を配置して、定盤1を均一に加熱することにより、定盤1上に載置された複数の被加工物3をそれぞれ加熱処理するもの等がある。

【0003】

【発明が解決しようとする課題】従来の均熱装置は以上

のように構成され、図12に示すものは平板状の発熱体2で定盤1の全面を同時に加熱することによって、温度分布の不均一を改善しようとするものであるが、平板状の発熱体2はヒータ配線を絶縁物で被覆したものであり、外形寸法精度に限界があるので、定盤1へ取り付けた際、全面にわたって定盤1と接触させることは困難であり、定盤1の表面の温度分布の均一性には限界があるため、厳しい温度分布精度を要求される被加工物3への適用は無理であり、又、仮に全体が均一に加熱されたとしても、定盤1の周辺部は中心部に比べて放熱が大きく、図13に示すように定盤1の周辺部で温度が低下するため、温度むらによる反りが発生して被加工物3が全面で均一に加熱されず、加工精度が低下する等の課題があった。

【0004】この発明は上記のような課題を解決するためになされたもので、熱源の熱が定盤の表面に均等に供給され、定盤の表面温度を均一に保持することにより、厳しい温度分布を要求される被加工物への適用、および加工精度の向上を図ることが可能な均熱装置を提供することを目的とするものである。

【0005】

【課題を解決するための手段】この発明の請求項1に係る均熱装置は、溝が複数形成された第1の板状部材とこの第1の板状部材に形成された溝を覆うように第1の板状部材に接合される第2の板状部材とにより構成され、上面に被加工物が載置される定盤と、第1の板状部材と第2の板状部材との間に形成され、内部に所定量の作動液が充填される複数の流通路と、被加工物を定盤を介して加熱または冷却する平面状の熱源とを設けたものである。

【0006】又、この発明の請求項2に係る均熱装置は、請求項1において、定盤板と平面状の熱源との間に伝熱性部材を装着したものである。

【0007】又、この発明の請求項3に係る均熱装置は、請求項1において、定盤の外周縁部に設けられたフランジ体と、フランジ体に係合され、平面状の熱源を定盤との間で挟持する押え部材とを設けたものである。

【0008】又、この発明の請求項4に係る均熱装置は、請求項1において、定盤の外周縁部に設けられた傾斜部をフランジ体と、平面状の熱源を定盤に接触させる押え部材と、フランジ体と押え部材とに係合され、一方側が枢点となり、他方側が一方側を枢点として開閉し、平面状の熱源を定盤と押え部材との間で挟持させる取付具とを設けたものである。

【0009】又、この発明の請求項5に係る均熱装置は、請求項3又は請求項4において、平面状の熱源をあらかじめお椀状に形成し、定盤と押え部材との間で挟持せるものである。

【0010】又、この発明の請求項6に係る均熱装置

は、請求項1において、平面状の熱源を複数に分割した

ものである。

【0011】又、この発明の請求項7に係る均熱装置は、請求項6において、複数に分割された平面状の熱源に対応して第1の板状部材と第2の板状部材との間に形成された流通路も複数に分割したものである。

【0012】

【発明の実施の形態】実施の形態1. 図1はこの発明の実施の形態1における均熱装置の構成を示す平面図、図2は図1における断面を示す側断面図である。図において、4は定盤であり、例えば下面に同心状に配置される複数の溝6が形成された第1の板状部材5とこの第1の板状部材5の溝6部を覆うよう第1の板状部材5に接合された第2の板状部材7とで構成されており、定盤4の上面には複数の被加工物3が載置される。8は第1の板状部材5と第2の板状部材7との間の環状の溝6で形成される複数の流通路であり、各内部にはそれぞれ真空排気された後、所定の量の作動液9が充填されて、定盤4が均熱板として形成される。10は定盤4の下面に配置された例えばヒータ等の加熱源である平面状の発熱体である。

【0013】上記のように構成された実施の形態1における均熱装置において、定盤1の下面から、平面状の発熱体10により加熱されると、各流通路8内の作動液9も加熱され、蒸気となって密閉された流通路8内にある空間に拡散し、この蒸気は流通路8内の温度の低い定盤4の上面側で凝縮潜熱として熱を放出し液化する。そして、この液化した作動液9は流通路8の内部で定盤4の下面側に重力により落下して還流し、この動作が順次繰り返されることにより、加熱源である平面状の発熱体10から定盤4の上面に熱輸送され、定盤4の上面に載置される被加工物3は加熱される。

【0014】このように上記実施の形態1によれば、加熱源である平面状の発熱体10からの熱量を、作動液9の蒸気により流通路8の内部に拡散し、定盤4の上面側で凝縮させることにより定盤4の上面側に熱輸送するようしているので、定盤4の表面を均一に加熱することができるため、外形寸法精度の悪い平面状のヒータである発熱体10と定盤4との間に接触の不均一な部分があっても、平面状の発熱体10の寸法精度にとらわれることなく均一に被加工物3を加熱することができる。また厳しい温度分布を要求される被加工物への適用、および加工精度の向上を図ることが可能な均熱装置を得ることができる。

【0015】実施の形態2. 上述した図1および図2に示す実施の形態1の構成では、定盤4と平面状の発熱体10とが直接接触で伝熱される場合を示しているが、この発明の実施の形態2においては、図3に示すように、定盤4と平面状の発熱体10との間に例えば伝熱性の高い接着剤若しくはグリースなど高伝熱性材料からなる伝熱性部材11を装着して接触させても良く、発熱体10

の寸法精度等により接触状態の不均一が起こりにくくなり、定盤4の均熱性が更に向上去き、また伝熱性も高くなるため発熱体10からの発熱量を小さくすることができる。また、厳しい温度分布を要求される被加工物への適用、および加工精度の向上を図ることが可能であることは勿論、さらに外形寸法精度の悪い発熱体でも適用することができる均熱装置を得ることができる。

【0016】実施の形態3. この発明の実施の形態3を図4および図5に基づいて説明する。これら各図において、4～10は上述した実施の形態1の構成と同様である。12は定盤4の外周縁部に設けられたフランジ体、13はこのフランジ体12に係合され、平面状の発熱体10を定盤4間とて挟持する押え部材、14はこの押え部材13とフランジ体12とを締め付け固定する固定ボルトである。このように、固定ボルト14を締め付け固定することにより、押え部材13によって発熱体10が定盤4に押さえつけられも発熱体10と定盤4との接触状態の密着性が向上去き、更に発熱体10を定盤4にしっかりと固定することができる。すなわち発熱体10からの熱を定盤4に効率よく伝えることができ、より高い均熱性を有する均熱装置を得ることができる。なお、定盤4と発熱体10との間は高伝熱性材料が介していてよいことは言うまでもない。

【0017】実施の形態4. この発明の実施の形態4を図6および図7に基づいて説明する。これら各図において、4～10は上述した実施の形態1の構成と同様である。15は定盤4の外周縁部に設けられた傾斜部を有するフランジ体、16は平面状の発熱体10を定盤4に接触させる押え部材、17はフランジ体15と押え部材16とに係合され、一方側17aが枢点部を成し、他方側17bが締付部を成し一方側17aを枢点として開閉し、他方側17bを締付ボルト18により閉状態に保持させて、平面状の発熱体10を定盤4と押え部材16とで挟持させる取付具である。このように、平面状の熱源10を定盤4に固定する際に取付具17の他方側17bの1カ所だけを締めつけることで固定することができ、また取付具17にも定盤1に設けられたフランジ体15と同様の傾斜部が設けられているため、他方側17bの1カ所を締め付けていくだけで定盤4と平面状の発熱体10との密着性を向上させることができる。すなわち組立性を改善させることができるとともに、より高い均熱性を有する均熱装置を得ることができる。なお、定盤4と発熱体10との間は高伝熱性材料が介していてよいことは言うまでもない。

【0018】実施の形態5. この発明の実施の形態5を図8に基づいて説明する。図8において、4～9、12、13は上述した実施の形態3の構成と同様である。19はあらかじめ中央が高くなるようなお椀状に形成された発熱体であり、上述した実施の形態3あるいは実施の形態4などの固定方法により、お椀状の発熱体19を

押え部材13と定盤4とで挟持することによって発熱体19を平面状と成すようにしている。これにより、接触性の比較的低い中央部の密着性を上述した実施の形態3あるいは実施の形態4のものより向上され、発熱体19から定盤4への伝熱性がより向上され、定盤4の均熱性も更に向上できる。なお、定盤4と発熱体19との間は高伝熱性材料が介することでさらに均熱性が向上できる。

【0019】実施の形態6. この発明の実施の形態6を図9に基づいて説明する。図9において、4～9は上述した各実施の形態の構成と同様である。20および21は上述した各実施の形態における平面状の発熱体を複数に分割して例えば部分的に発熱量の異なる発熱体であり、定盤4の中央側に位置する発熱体20と、定盤4の外周側に位置する発熱体21としたものである。これにより定盤4の面内の温度分布をある程度コントロールすることができるため、たとえば放熱の影響で定盤4の外周側の温度が低い場合、外周側の発熱体21の発熱量を増加させることで定盤4の外周側の温度低下を補うことができるので、定盤4を均熱に保持することができ、信頼性に優れた均熱装置を得ることができる。

【0020】実施の形態7. この発明の実施の形態7を図10および図11に基づいて説明する。これら各図において、4～7、9、20、21は上述した実施の形態6の構成と同様である。22および23は複数に分割された発熱体20および21にそれぞれ対応して複数に分割された流通路であり、すなわち定盤4の中央側に位置する発熱体20に対応して流通路22を設け、定盤4の外周側に位置する発熱体21に対応して流通路23を流通路22と分離して設けたことにより、定盤4の面内の温度分布を細かくコントロールすることができるため、たとえば放熱の影響で定盤4の外周側の温度が極端に低い場合でも、外周側の発熱体21の発熱量を増加させ効率よく定盤4の外周側の温度低下を補うことができる。

【0021】

【発明の効果】以上のように、この発明の請求項1によれば、溝が複数形成された第1の板状部材とこの第1の板状部材に形成された溝を覆うように第1の板状部材に接合される第2の板状部材とにより構成され、上面に被加工物が載置される定盤と、第1の板状部材と第2の板状部材との間に形成され、内部に所定量の作動液が充填される複数の流通路と、被加工物を定盤を介して加熱または冷却する平面状の熱源とを設けたことにより、被加工物の加工精度の向上を図ることができる。

【0022】又、この発明の請求項2によれば、請求項1において、定盤板と平面状の熱源との間に伝熱性部材を装着したことにより、さらに被加工物の加工精度の向上を図ることができる。

【0023】又、この発明の請求項3によれば、請求項1において、定盤の外周縁部に設けられたフランジ体

と、フランジ体に係合され、平面状の熱源を定盤との間で挟持する押え部材とを設けたことにより、発熱体からの熱を定盤に効率よく伝えることができ、より高い均熱性を有する均熱装置を得ることができる。

【0024】又、この発明の請求項4によれば、請求項1において、定盤の外周縁部に設けられた傾斜部をフランジ体と、平面状の熱源を定盤に接触させる押え部材と、フランジ体と押え部材とに係合され、一方側が枢点となり、他方側が一方側を枢点として開閉し、平面状の熱源を定盤と押え部材との間で挟持させる取付具とを設けたことにより、組立性を改善させることができるとともに、より高い均熱性を有する均熱装置を得ることができる。

【0025】又、この発明の請求項5によれば、請求項3または請求項4において、平面状の熱源をあらかじめお椀状に形成し、定盤と押え部材との間で挟持させることにより、定盤と発熱体との中央付近の密着性をより向上させることができ、発熱体からの熱を定盤に効率よく伝えることができ、より高い均熱性を有する均熱装置を得ることができる。

【0026】又、この発明の請求項6によれば、請求項1において、平面状の熱源を複数に分割したことにより、発熱量によるある程度の温度分布のコントロールができるためより高い均熱性を有する均熱装置を得ることができる。

【0027】又、この発明の請求項7によれば、請求項6において、複数に分割された平面状の熱源に対応して第1の板状部材と第2の板状部材との間に形成された流通路も複数に分割したことにより、発熱量による細かな温度分布のコントロールができるため、より高い均熱性を有する均熱装置を得ることができる。

【図面の簡単な説明】

【図1】 この発明の実施の形態1を示す平面図である。

【図2】 この発明の実施の形態1を示す断面図である。

【図3】 この発明の実施の形態2を示す断面図である。

【図4】 この発明の実施の形態3を示す平面図である。

【図5】 この発明の実施の形態3を示す断面図である。

【図6】 この発明の実施の形態4を示す平面図である。

【図7】 この発明の実施の形態4を示す断面図である。

【図8】 この発明の実施の形態5を示す断面図である。

【図9】 この発明の実施の形態6を示す断面図である。

DERWENT-ACC-NO: 2000-561026

DERWENT-WEEK: 200052

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TITLE: Equalizer for heating or cooling resin molded goods, includes flat surface heat source which heats or cools processed object placed on upper surface of fixed board

PATENT-ASSIGNEE: MITSUBISHI ELECTRIC CORP [MITQ]

PRIORITY-DATA: 1999JP-0021428 (January 29, 1999)

PATENT-FAMILY:

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INT-CL (IPC): B24B037/00, B24B037/04 , H01L021/304

ABSTRACTED-PUB-NO: JP2000218516A

BASIC-ABSTRACT:

NOVELTY - Plate-shaped element (5) with groove (6) is joined to another element (7), so that grooves are covered. Fixed board (4) is mounted on upper surface of element (5). Circulation paths (8,9) filled with working fluid of preset amount, is formed between elements. Processed objects (3) e.g. resin-molded goods is mounted on upper surface of board, is heated or cooled by flat surface heat source (10) via board.

USE - For heating or cooling processed objects such as resin molded goods, semiconductor wafer, LC panel.

ADVANTAGE - Since heat source heats or cools processed object uniformly via a fixed board, forming accuracy of processed object is improved.

DESCRIPTION OF DRAWING(S) - The figure shows sectional view of equalizer.

Processed object 3

Fixed board 4

Plate-shaped elements 5,7

Groove 6

Circulation paths 8,9

Heat source 10

CHOSEN-DRAWING: Dwg. 2/13

TITLE-TERMS: HEAT COOLING RESIN GOODS FLAT SURFACE HEAT SOURCE HEAT COOLING PROCESS OBJECT PLACE UPPER SURFACE FIX BOARD

DERWENT-CLASS: P61 U11

EPI-CODES: U11-C01X; U11-C15A;

SECONDARY-ACC-NO:

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(21)Application number : 11-021428 (71)Applicant : MITSUBISHI ELECTRIC CORP

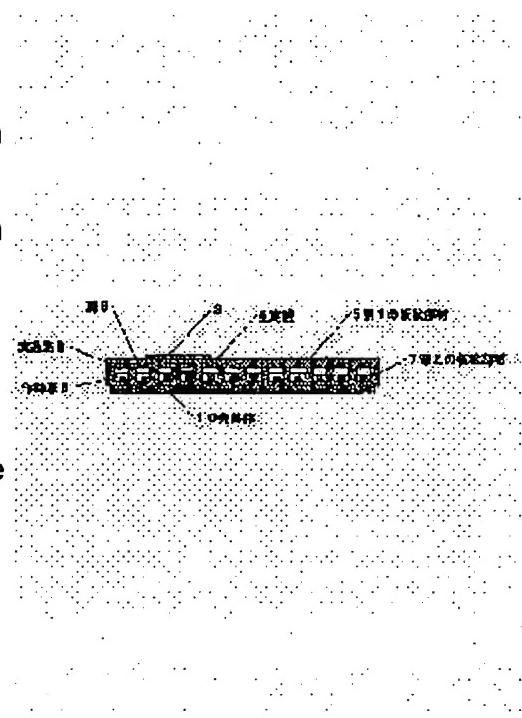
(22)Date of filing : 29.01.1999 (72)Inventor : MIYAZAKI SHINJI
YAMAKAGE HISAAKI
YOSHINAGA ISAO

(54) SOAKING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a soaking device which can apply a severe temperature distribution to a required work and improve a processing accuracy by supplying the heat of a heat source to the surface of a surface plate uniformly and keeping the surface temperature of the surface plate uniformly.

SOLUTION: This device is constituted by a first plate member 5 on which a plurality of grooves 6 are formed and a second plate member 7 connected to the first plate member 5 so as to cover the grooves 6 formed on this first plate member 5 and is provided with the surface plate 4 on whose upper surface a work 3 is placed, a plurality of flow routes 8, formed between the first plate member 5 and second plate member 7, in whose inside the operation liquid 9 with a prescribed amount is filled and a plane heat source 10 for heating or cooling the work 3 through the surface plate 4.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the equalizer heated or cooled to homogeneity on the surface plate into which it is processed by workpieces, such as for example, a resin cast, a semiconductor wafer, and a liquid crystal panel.

[0002]

[Description of the Prior Art] As it is shown in JP,6-278139,A as a conventional equalizer although illustration is not carried out for example By inserting a heater and a cooling pipe in the hole processed on the interior of a surface plate, respectively, and circulating cooling water to energization and a cooling pipe at a heater As a surface plate is shown in the thing which direct-heats and is cooled, and drawing 12 , there are some which heat-treat two or more workpieces 3 laid on the surface plate 1, respectively by arranging the plate-like heating element 2 on the inferior surface of tongue of a surface plate 1, and heating a surface plate 1 to homogeneity.

[0003]

[Problem(s) to be Solved by the Invention] Although it is going to improve the ununiformity of temperature distribution when the conventional equalizer is constituted as mentioned above and what is shown in drawing 12 heats the whole surface of a surface plate 1 to coincidence with the plate-like heating element 2 Since the plate-like heating element 2 covers heater wiring with an insulating material and a limitation is in dimension precision Since it is difficult to make a surface plate 1 contact over the whole surface and there is a limitation in the homogeneity of the temperature distribution of the front face of a surface plate 1, in case it attaches in a surface plate 1, Since temperature will fall by the periphery of a surface plate 1 as the periphery of a surface plate 1 has large heat dissipation compared with a core and it is shown in drawing 13 even if the whole is heated by homogeneity by force as for the application to the workpiece 3 of which a severe temperature-distribution precision is required, The curvature by temperature unevenness occurred, and a workpiece 3 was not heated by homogeneity on the whole surface, but the technical problem of process tolerance falling occurred.

[0004] It was made in order that this invention might solve the above technical problems, and the heat of a heat source is equally supplied on the surface of a surface plate, and it aims at offering the equalizer which can aim at application to the workpiece of which severe temperature distribution are required, and improvement in process tolerance by holding the skin temperature of a surface plate to homogeneity.

[0005]

[Means for Solving the Problem] The equalizer concerning claim 1 of this invention is constituted by the 2nd plate-like part material joined to the 1st plate-like part material so that the slot where the slot was formed in the 1st plate-like part material by which two or more formation was carried out, and this 1st plate-like part material may be covered. It is formed between the surface plate with which a workpiece is laid in a top face, and the 1st plate-like part material and the 2nd plate-like part material, and two or more circulation ways where the interior is filled up with the working fluid of the specified quantity, and the plane heat source which heats or cools a workpiece through a surface plate are established.

[0006] Moreover, the equalizer concerning claim 2 of this invention equips with a heat-conducting characteristic member between a surface plate plate and a plane heat source in claim 1.

[0007] Moreover, in claim 1, the equalizer concerning claim 3 of this invention engages with the flange object prepared in the periphery edge of a surface plate, and a flange object, and prepares the presser-foot member which pinches a plane heat source between surface plates.

[0008] Moreover, the equalizer concerning claim 4 of this invention prepares the fixture which the other side opens and closes one side as *****, and presses down the ramp prepared in the periphery edge of a surface plate in claim 1 with a flange object, the presser-foot member which contacts a plane heat source to a surface plate, and a flange object, presses [it engages with a member and one side serves as *****, and] down a plane heat source with a surface plate, and is made to pinch between members.

[0009] Moreover, the equalizer concerning claim 5 of this invention forms a plane heat source in the shape of a bowl beforehand, presses it down with a surface plate, and is made to pinch between members in claim 3 or claim 4.

[0010] Moreover, the equalizer concerning claim 6 of this invention divides a plane heat source into plurality in claim 1.

[0011] Moreover, in claim 6, the circulation way formed corresponding to the plane heat source divided into plurality between the 1st plate-like part material and the 2nd plate-like part material also divides the equalizer concerning claim 7 of this invention into plurality.

[0012]

[Embodiment of the Invention] The top view and drawing 2 R> 2 which show the configuration of an equalizer [in / in gestalt 1. drawing 1 of operation / the gestalt 1 of implementation of this invention] are the sectional side elevation showing the cross section in drawing 1. In drawing, 4 is a surface plate, for example, the slot 6 section of the 1st plate-like part material 5 by which two or more slots 6 arranged concentrically were formed in the inferior surface of tongue, and this 1st plate-like part material 5 is constituted from the 2nd plate-like part material 7 joined to the plate-like part material 5 of the method 1st of a wrap, and two or more workpieces 3 are laid in the top face of a surface plate 4. 8 is two or more circulation ways formed in the annular slot 6 between the 1st plate-like part material 5 and the 2nd plate-like part material 7, after evacuation is carried out to the interior of each, respectively, it fills up with the working fluid 9 of a predetermined amount, and a surface plate 4 is formed as a soak plate. 10 is a heating element of the plane which are sources of heating, such as a heater, for example arranged on the inferior surface of tongue of a surface plate 4.

[0013] In the equalizer in the gestalt 1 of the operation constituted as mentioned above, if heated with the plane heating element 10 from the inferior surface of tongue of a surface plate 1, the working fluid 9 in each circulation way 8 is also heated, and it is spread to the space in the circulation way 8 sealed by becoming a steam, and by the top-face side of the surface plate 4 with the low temperature in the circulation way 8, this steam will emit heat as condensation latent heat, and will liquefy. And by this liquefied working fluid's 9 falling with gravity, flowing back to the inferior-surface-of-tongue side of a surface plate 4, inside the circulation way 8, and repeating this actuation successively, heat transport is carried out to the top face of a surface plate 4 from the plane heating element 10 which is a source of heating, and the workpiece 3 laid in the top face of a surface plate 4 is heated.

[0014] According to the gestalt 1 of the above-mentioned implementation, thus, the heating value from the plane heating element 10 which is a source of heating Since it is made to carry out heat transport to the top-face side of a surface plate 4 by being spread inside the circulation way 8 with the steam of a working fluid 9, and making it condense by the top-face side of a surface plate 4 Since the front face of a surface plate 4 can be heated to homogeneity, even if the uneven part of contact is between the heating elements 10 and surface plates 4 which are a plane heater with a bad dimension precision, a workpiece 3 can be heated to homogeneity, without being caught by the dimensional accuracy of the plane heating element 10. Moreover, the equalizer which can aim at application to the workpiece of which severe temperature distribution are required, and improvement in process tolerance can be obtained.

[0015] Although the configuration of the gestalt 1 of operation shown in drawing 1 and drawing 2 of operation of which gestalt 2. **** was done shows the case where heat transfer of a surface plate 4 and

the plane heating element 10 is carried out by direct contact In the gestalt 2 of implementation of this invention, as shown in drawing 3, between a surface plate 4 and the plane heating element 10, it may equip with the heat-conducting characteristic member 11 which consists of high heat-conducting characteristic ingredients, such as high adhesives or grease of heat-conducting characteristic, and it may be contacted. Since the ununiformity of a contact condition stops being able to happen easily due to the dimensional accuracy of a heating element 10 etc., and the soak nature of a surface plate 4 can improve further and heat-conducting characteristic also becomes high, calorific value from a heating element 10 can be made small. Moreover, that it is possible to aim at application to the workpiece of which severe temperature distribution are required, and improvement in process tolerance can obtain an equalizer applicable [with a heating element with an of course still worse dimension precision].

[0016] gestalt 3. of operation -- the gestalt 3 of implementation of this invention is explained based on drawing 4 and drawing 5. In each [these] drawing, 4-10 are the same as that of the configuration of the gestalt 1 of operation mentioned above. The presser-foot member which the flange object with which 12 was prepared in the periphery edge of a surface plate 4, and 13 engage with this flange object 12, and pinches the plane heating element 10 between surface plates 4, and 14 are securing bolts which bind this presser-foot member 13 and the flange object 12 tight, and are fixed. thus, therefore, a heating element 10 presses down to the presser-foot member 13 by binding a securing bolt 14 tight and fixing at a surface plate 4 -- also having -- the adhesion of the contact condition of a heating element 10 and a surface plate 4 can be improved, and a heating element 10 can be further fixed to a surface plate 4 firmly. That is, the heat from a heating element 10 can be efficiently told to a surface plate 4, and the equalizer which has higher soak nature can be obtained. In addition, it cannot be overemphasized that the high heat-conducting characteristic ingredient may mind between a surface plate 4 and a heating element 10.

[0017] gestalt 4. of operation -- the gestalt 4 of implementation of this invention is explained based on drawing 6 and drawing 7. In each [these] drawing, 4-10 are the same as that of the configuration of the gestalt 1 of operation mentioned above. The flange object which has the ramp by which 15 was prepared in the periphery edge of a surface plate 4, the presser-foot member 16 contacts [member] the plane heating element 10 to a surface plate 4, 17 presses down with the flange object 15, engage with a member 16, and one side 17a accomplishes *****. It is the fixture which other side 17b accomplishes a fastening part, opens and closes one side 17a as *****, makes other side 17b hold to a closed state with a locking bolt 18, presses down the plane heating element 10 with a surface plate 4, and makes pinch by the member 16. Thus, since the same ramp as the flange object 15 prepared [fixed by binding only one place of other side 17b of a fixture 17 tight] also in the fixture 17 at the surface plate 1 is prepared in case the plane heat source 10 is fixed to a surface plate 4, the adhesion of a surface plate 4 and the plane heating element 10 can be raised only by binding one place of other side 17b tight. That is, while being able to make assembly nature improve, the equalizer which has higher soak nature can be obtained. In addition, it cannot be overemphasized that the high heat-conducting characteristic ingredient may mind between a surface plate 4 and a heating element 10.

[0018] gestalt 5. of operation -- the gestalt 5 of implementation of this invention is explained based on drawing 8. In drawing 8, 4-9, and 12 and 13 are the same as that of the configuration of the gestalt 3 of operation mentioned above. 19 is the heating element formed in the shape of [to which a center becomes high beforehand / like] a bowl, and he is trying to accomplish a heating element 19 with a plane by pressing down the bowl-like heating element 19 and pinching with a member 13 and a surface plate 4 by the fixed approaches, such as the gestalt 3 of operation mentioned above, or the gestalt 4 of operation. thereby, there is operation which mentioned above the adhesion of the comparatively low center section of contact nature gestalt 3 -- it is, it carries out and improves from the thing of the gestalt 4 of operation, and the heat-conducting characteristic from a heating element 19 to a surface plate 4 improves more, and soak nature's of a surface plate 4 can improve further. In addition, between a surface plate 4 and a heating element 19, soak nature can be further improved because a high heat-conducting characteristic ingredient minds.

[0019] gestalt 6. of operation -- the gestalt 6 of implementation of this invention is explained based on

drawing 9 . In drawing 9 , 4-9 are the same as that of the configuration of the gestalt of each operation mentioned above. 20 and 21 are heating elements with which the plane heating element in the gestalt of each operation mentioned above is divided into plurality, for example, calorific value differs partially, and are taken as the heating element 20 located in the central site of a surface plate 4, and the heating element 21 located in the periphery side of a surface plate 4. Under the effect of heat dissipation, since the temperature distribution within the field of a surface plate 4 are controllable to some extent by this, when the temperature by the side of the periphery of a surface plate 4 is low, by that which can compensate the temperature fall by the side of the periphery of a surface plate 4 with making the calorific value of the heating element 21 by the side of a periphery increase, a surface plate 4 can be held to soak and the equalizer excellent in dependability can be obtained.

[0020] gestalt 7. of operation -- the gestalt 7 of implementation of this invention is explained based on drawing 10 and drawing 11 . In each [these] drawing, 4-7, and 9, 20 and 21 are the same as that of the configuration of the gestalt 6 of operation mentioned above. 22 and 23 are the circulation ways divided into plurality respectively corresponding to the heating elements 20 and 21 divided into plurality. Namely, by having formed the circulation way 22 corresponding to the heating element 20 located in the central site of a surface plate 4, having dissociated with the circulation way 22 and having formed the circulation way 23 corresponding to the heating element 21 located in the periphery side of a surface plate 4 Since the temperature distribution within the field of a surface plate 4 are finely controllable, even when the temperature by the side of the periphery of a surface plate 4 is extremely low, the calorific value of the heating element 21 by the side of a periphery is made to increase, and the temperature fall by the side of the periphery of a surface plate 4 can be efficiently compensated with the effect of heat dissipation.

[0021]

[Effect of the Invention] As mentioned above, it is constituted by the 2nd plate-like part material joined to the 1st plate-like part material so that the slot where the slot was formed in the 1st plate-like part material by which two or more formation was carried out, and this 1st plate-like part material may be covered according to claim 1 of this invention. Two or more circulation ways where it is formed between the surface plate with which a workpiece is laid in a top face, and the 1st plate-like part material and the 2nd plate-like part material, and the interior is filled up with the working fluid of the specified quantity, Improvement in the process tolerance of a workpiece can be aimed at by having established the plane heat source which heats or cools a workpiece through a surface plate.

[0022] Moreover, according to claim 2 of this invention, in claim 1, improvement in the process tolerance of a workpiece can be further aimed at by having equipped with the heat-conducting characteristic member between the surface plate plate and the plane heat source.

[0023] Moreover, in claim 1, by having engaged with the flange object prepared in the periphery edge of a surface plate, and the flange object, and having prepared the presser-foot member which pinches a plane heat source between surface plates, the heat from a heating element can be efficiently told to a surface plate, and, according to claim 3 of this invention, the equalizer which has higher soak nature can be obtained.

[0024] According to claim 4 of this invention, in claim 1, the ramp prepared in the periphery edge of a surface plate Moreover, a flange object, Press down a plane heat source with the presser-foot member contacted to a surface plate, and a flange object, and it engages with a member. While being able to make assembly nature improve by one side's having become **** and having prepared the fixture which the other side opens and closes one side as ****, presses down a plane heat source with a surface plate, and makes pinch between members, the equalizer which has higher soak nature can be obtained.

[0025] Moreover, in claim 3 or claim 4, by forming a plane heat source in the shape of a bowl beforehand, pressing down with a surface plate, and making it pinch between members, the adhesion near the center of a surface plate and a heating element can be raised more, the heat from a heating element can be efficiently told to a surface plate, and, according to claim 5 of this invention, the equalizer which has higher soak nature can be obtained.

[0026] Moreover, according to claim 6 of this invention, in claim 1, by having divided the plane heat

source into plurality, since control of a certain amount of temperature distribution by calorific value can be performed, the equalizer which has high soak nature can be obtained.

[0027] Moreover, since control of the fine temperature distribution by calorific value can be performed by having divided into plurality the circulation way formed in claim 6 corresponding to the plane heat source divided into plurality between the 1st plate-like part material and the 2nd plate-like part material according to claim 7 of this invention, the equalizer which has higher soak nature can be obtained.

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[Description of the Prior Art] As it is shown in JP,6-278139,A as a conventional equalizer although illustration is not carried out for example By inserting a heater and a cooling pipe in the hole processed on the interior of a surface plate, respectively, and circulating cooling water to energization and a cooling pipe at a heater As a surface plate is shown in the thing which direct-heats and is cooled, and drawing 12 , there are some which heat-treat two or more workpieces 3 laid on the surface plate 1, respectively by arranging the plate-like heating element 2 on the inferior surface of tongue of a surface plate 1, and heating a surface plate 1 to homogeneity.

[0003]

[Problem(s) to be Solved by the Invention] Although it is going to improve the ununiformity of temperature distribution when the conventional equalizer is constituted as mentioned above and what is shown in drawing 12 heats the whole surface of a surface plate 1 to coincidence with the plate-like heating element 2 Since the plate-like heating element 2 covers heater wiring with an insulating material and a limitation is in dimension precision Since it is difficult to make a surface plate 1 contact over the whole surface and there is a limitation in the homogeneity of the temperature distribution of the front face of a surface plate 1, in case it attaches in a surface plate 1, Since temperature will fall by the periphery of a surface plate 1 as the periphery of a surface plate 1 has large heat dissipation compared with a core and it is shown in drawing 13 even if the whole is heated by homogeneity by force as for the application to the workpiece 3 of which a severe temperature-distribution precision is required, The curvature by temperature unevenness occurred, and a workpiece 3 was not heated by homogeneity on the whole surface, but the technical problem of process tolerance falling occurred.

[0004] It was made in order that this invention might solve the above technical problems, and the heat of a heat source is equally supplied on the surface of a surface plate, and it aims at offering the equalizer which can aim at application to the workpiece of which severe temperature distribution are required, and improvement in process tolerance by holding the skin temperature of a surface plate to homogeneity.

[0005]

[Means for Solving the Problem] The equalizer concerning claim 1 of this invention is constituted by the 2nd plate-like part material joined to the 1st plate-like part material so that the slot where the slot was formed in the 1st plate-like part material by which two or more formation was carried out, and this 1st plate-like part material may be covered. It is formed between the surface plate with which a workpiece is laid in a top face, and the 1st plate-like part material and the 2nd plate-like part material, and two or more circulation ways where the interior is filled up with the working fluid of the specified quantity, and the plane heat source which heats or cools a workpiece through a surface plate are established.

[0006] Moreover, the equalizer concerning claim 2 of this invention equips with a heat-conducting characteristic member between a surface plate plate and a plane heat source in claim 1.

[0007] Moreover, in claim 1, the equalizer concerning claim 3 of this invention engages with the flange object prepared in the periphery edge of a surface plate, and a flange object, and prepares the presser-foot member which pinches a plane heat source between surface plates.

[0008] Moreover, the equalizer concerning claim 4 of this invention prepares the fixture which the other side opens and closes one side as *****, and presses down the ramp prepared in the periphery edge of a surface plate in claim 1 with a flange object, the presser-foot member which contacts a plane heat source to a surface plate, and a flange object, presses [it engages with a member and one side serves as *****, and] down a plane heat source with a surface plate, and is made to pinch between members.

[0009] Moreover, the equalizer concerning claim 5 of this invention forms a plane heat source in the shape of a bowl beforehand, presses it down with a surface plate, and is made to pinch between members in claim 3 or claim 4.

[0010] Moreover, the equalizer concerning claim 6 of this invention divides a plane heat source into plurality in claim 1.

[0011] Moreover, in claim 6, the circulation way formed corresponding to the plane heat source divided into plurality between the 1st plate-like part material and the 2nd plate-like part material also divides the equalizer concerning claim 7 of this invention into plurality.

[0012]

[Embodiment of the Invention] The top view and drawing 2 R> 2 which show the configuration of an equalizer [in / in gestalt 1. drawing 1 of operation / the gestalt 1 of implementation of this invention] are the sectional side elevation showing the cross section in drawing 1. In drawing, 4 is a surface plate, for example, the slot 6 section of the 1st plate-like part material 5 by which two or more slots 6 arranged concentrically were formed in the inferior surface of tongue, and this 1st plate-like part material 5 is constituted from the 2nd plate-like part material 7 joined to the plate-like part material 5 of the method 1st of a wrap, and two or more workpieces 3 are laid in the top face of a surface plate 4. 8 is two or more circulation ways formed in the annular slot 6 between the 1st plate-like part material 5 and the 2nd plate-like part material 7, after evacuation is carried out to the interior of each, respectively, it fills up with the working fluid 9 of a predetermined amount, and a surface plate 4 is formed as a soak plate. 10 is a heating element of the plane which are sources of heating, such as a heater, for example arranged on the inferior surface of tongue of a surface plate 4.

[0013] In the equalizer in the gestalt 1 of the operation constituted as mentioned above, if heated with the plane heating element 10 from the inferior surface of tongue of a surface plate 1, the working fluid 9 in each circulation way 8 is also heated, and it is spread to the space in the circulation way 8 sealed by becoming a steam, and by the top-face side of the surface plate 4 with the low temperature in the circulation way 8, this steam will emit heat as condensation latent heat, and will liquefy. And by this liquefied working fluid's 9 falling with gravity, flowing back to the inferior-surface-of-tongue side of a surface plate 4, inside the circulation way 8, and repeating this actuation successively, heat transport is carried out to the top face of a surface plate 4 from the plane heating element 10 which is a source of heating, and the workpiece 3 laid in the top face of a surface plate 4 is heated.

[0014] According to the gestalt 1 of the above-mentioned implementation, thus, the heating value from the plane heating element 10 which is a source of heating Since it is made to carry out heat transport to the top-face side of a surface plate 4 by being spread inside the circulation way 8 with the steam of a working fluid 9, and making it condense by the top-face side of a surface plate 4 Since the front face of a surface plate 4 can be heated to homogeneity, even if the uneven part of contact is between the heating elements 10 and surface plates 4 which are a plane heater with a bad dimension precision, a workpiece 3 can be heated to homogeneity, without being caught by the dimensional accuracy of the plane heating element 10. Moreover, the equalizer which can aim at application to the workpiece of which severe temperature distribution are required, and improvement in process tolerance can be obtained.

[0015] Although the configuration of the gestalt 1 of operation shown in drawing 1 and drawing 2 of operation of which gestalt 2. *** was done shows the case where heat transfer of a surface plate 4 and

the plane heating element 10 is carried out by direct contact In the gestalt 2 of implementation of this invention, as shown in drawing 3, between a surface plate 4 and the plane heating element 10, it may equip with the heat-conducting characteristic member 11 which consists of high heat-conducting characteristic ingredients, such as high adhesives or grease of heat-conducting characteristic, and it may be contacted. Since the ununiformity of a contact condition stops being able to happen easily due to the dimensional accuracy of a heating element 10 etc., and the soak nature of a surface plate 4 can improve further and heat-conducting characteristic also becomes high, calorific value from a heating element 10 can be made small. Moreover, that it is possible to aim at application to the workpiece of which severe temperature distribution are required, and improvement in process tolerance can obtain an equalizer applicable [with a heating element with an of course still worse dimension precision].

[0016] gestalt 3. of operation -- the gestalt 3 of implementation of this invention is explained based on drawing 4 and drawing 5. In each [these] drawing, 4-10 are the same as that of the configuration of the gestalt 1 of operation mentioned above. The presser-foot member which the flange object with which 12 was prepared in the periphery edge of a surface plate 4, and 13 engage with this flange object 12, and pinches the plane heating element 10 between surface plates 4, and 14 are securing bolts which bind this presser-foot member 13 and the flange object 12 tight, and are fixed. thus, therefore, a heating element 10 presses down to the presser-foot member 13 by binding a securing bolt 14 tight and fixing at a surface plate 4 -- also having -- the adhesion of the contact condition of a heating element 10 and a surface plate 4 can be improved, and a heating element 10 can be further fixed to a surface plate 4 firmly. That is, the heat from a heating element 10 can be efficiently told to a surface plate 4, and the equalizer which has higher soak nature can be obtained. In addition, it cannot be overemphasized that the high heat-conducting characteristic ingredient may mind between a surface plate 4 and a heating element 10.

[0017] gestalt 4. of operation -- the gestalt 4 of implementation of this invention is explained based on drawing 6 and drawing 7. In each [these] drawing, 4-10 are the same as that of the configuration of the gestalt 1 of operation mentioned above. The flange object which has the ramp by which 15 was prepared in the periphery edge of a surface plate 4, the presser-foot member 16 contacts [member] the plane heating element 10 to a surface plate 4, 17 presses down with the flange object 15, engage with a member 16, and one side 17a accomplishes *****. It is the fixture which other side 17b accomplishes a fastening part, opens and closes one side 17a as ****, makes other side 17b hold to a closed state with a locking bolt 18, presses down the plane heating element 10 with a surface plate 4, and makes pinch by the member 16. Thus, since the same ramp as the flange object 15 prepared [fixed by binding only one place of other side 17b of a fixture 17 tight] also in the fixture 17 at the surface plate 1 is prepared in case the plane heat source 10 is fixed to a surface plate 4, the adhesion of a surface plate 4 and the plane heating element 10 can be raised only by binding one place of other side 17b tight. That is, while being able to make assembly nature improve, the equalizer which has higher soak nature can be obtained. In addition, it cannot be overemphasized that the high heat-conducting characteristic ingredient may mind between a surface plate 4 and a heating element 10.

[0018] gestalt 5. of operation -- the gestalt 5 of implementation of this invention is explained based on drawing 8. In drawing 8, 4-9, and 12 and 13 are the same as that of the configuration of the gestalt 3 of operation mentioned above. 19 is the heating element formed in the shape of [to which a center becomes high beforehand / like] a bowl, and he is trying to accomplish a heating element 19 with a plane by pressing down the bowl-like heating element 19 and pinching with a member 13 and a surface plate 4 by the fixed approaches, such as the gestalt 3 of operation mentioned above, or the gestalt 4 of operation. thereby, there is operation which mentioned above the adhesion of the comparatively low center section of contact nature gestalt 3 -- it is, it carries out and improves from the thing of the gestalt 4 of operation, and the heat-conducting characteristic from a heating element 19 to a surface plate 4 improves more, and soak nature's of a surface plate 4 can improve further. In addition, between a surface plate 4 and a heating element 19, soak nature can be further improved because a high heat-conducting characteristic ingredient minds.

[0019] gestalt 6. of operation -- the gestalt 6 of implementation of this invention is explained based on

drawing 9. In drawing 9, 4-9 are the same as that of the configuration of the gestalt of each operation mentioned above. 20 and 21 are heating elements with which the plane heating element in the gestalt of each operation mentioned above is divided into plurality, for example, calorific value differs partially, and are taken as the heating element 20 located in the central site of a surface plate 4, and the heating element 21 located in the periphery side of a surface plate 4. Under the effect of heat dissipation, since the temperature distribution within the field of a surface plate 4 are controllable to some extent by this, when the temperature by the side of the periphery of a surface plate 4 is low, by that which can compensate the temperature fall by the side of the periphery of a surface plate 4 with making the calorific value of the heating element 21 by the side of a periphery increase, a surface plate 4 can be held to soak and the equalizer excellent in dependability can be obtained.

[0020] gestalt 7. of operation -- the gestalt 7 of implementation of this invention is explained based on drawing 10 and drawing 11. In each [these] drawing, 4-7, and 9, 20 and 21 are the same as that of the configuration of the gestalt 6 of operation mentioned above. 22 and 23 are the circulation ways divided into plurality respectively corresponding to the heating elements 20 and 21 divided into plurality. Namely, by having formed the circulation way 22 corresponding to the heating element 20 located in the central site of a surface plate 4, having dissociated with the circulation way 22 and having formed the circulation way 23 corresponding to the heating element 21 located in the periphery side of a surface plate 4 Since the temperature distribution within the field of a surface plate 4 are finely controllable, even when the temperature by the side of the periphery of a surface plate 4 is extremely low, the calorific value of the heating element 21 by the side of a periphery is made to increase, and the temperature fall by the side of the periphery of a surface plate 4 can be efficiently compensated with the effect of heat dissipation.

[0021]

[Effect of the Invention] As mentioned above, it is constituted by the 2nd plate-like part material joined to the 1st plate-like part material so that the slot where the slot was formed in the 1st plate-like part material by which two or more formation was carried out, and this 1st plate-like part material may be covered according to claim 1 of this invention. Two or more circulation ways where it is formed between the surface plate with which a workpiece is laid in a top face, and the 1st plate-like part material and the 2nd plate-like part material, and the interior is filled up with the working fluid of the specified quantity, Improvement in the process tolerance of a workpiece can be aimed at by having established the plane heat source which heats or cools a workpiece through a surface plate.

[0022] Moreover, according to claim 2 of this invention, in claim 1, improvement in the process tolerance of a workpiece can be further aimed at by having equipped with the heat-conducting characteristic member between the surface plate plate and the plane heat source.

[0023] Moreover, in claim 1, by having engaged with the flange object prepared in the periphery edge of a surface plate, and the flange object, and having prepared the presser-foot member which pinches a plane heat source between surface plates, the heat from a heating element can be efficiently told to a surface plate, and, according to claim 3 of this invention, the equalizer which has higher soak nature can be obtained.

[0024] According to claim 4 of this invention, in claim 1, the ramp prepared in the periphery edge of a surface plate Moreover, a flange object, Press down a plane heat source with the presser-foot member contacted to a surface plate, and a flange object, and it engages with a member. While being able to make assembly nature improve by one side's having become **** and having prepared the fixture which the other side opens and closes one side as ****, presses down a plane heat source with a surface plate, and makes pinch between members, the equalizer which has higher soak nature can be obtained.

[0025] Moreover, in claim 3 or claim 4, by forming a plane heat source in the shape of a bowl beforehand, pressing down with a surface plate, and making it pinch between members, the adhesion near the center of a surface plate and a heating element can be raised more, the heat from a heating element can be efficiently told to a surface plate, and, according to claim 5 of this invention, the equalizer which has higher soak nature can be obtained.

[0026] Moreover, according to claim 6 of this invention, in claim 1, by having divided the plane heat

source into plurality, since control of a certain amount of temperature distribution by calorific value can be performed, the equalizer which has high soak nature can be obtained.

[0027] Moreover, since control of the fine temperature distribution by calorific value can be performed by having divided into plurality the circulation way formed in claim 6 corresponding to the plane heat source divided into plurality between the 1st plate-like part material and the 2nd plate-like part material according to claim 7 of this invention, the equalizer which has higher soak nature can be obtained.

[Translation done.]